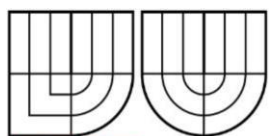




VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
BRNO UNIVERSITY OF TECHNOLOGY



FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ



FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

RODINNÝ DŮM

DETACHED FAMILY RESIDENCE

BAKALÁŘSKÁ PRÁCE

BACHELOR'S THESIS

AUTOR PRÁCE

AUTHOR

BENJAMIN KOLEGAR

VEDOUCÍ PRÁCE

SUPERVISOR

Ing. FRANTIŠEK VAJKAY, Ph.D.

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VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ FAKULTA STAVEBNÍ

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ZADÁNÍ BAKALÁŘSKÉ PRÁCE

Student Benjamin Kolegar

Název Detached family residence

Vedoucí bakalářské práce Ing. František Vajkay, Ph.D.

**Datum zadání
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V Brně dne 30. 11. 2014

.....
prof. Ing. Miloslav Novotný, CSc.
Vedoucí ústavu

.....
prof. Ing. Rostislav Drochytka, CSc., MBA
Děkan Fakulty stavební VUT

Podklady a literatura

Studie dispozičního řešení stavby, katalogy a odborná literatura, Zákon č.183/2006 Sb., Zákon č. 350/2012, kterým se mění zákon č. 183/2006 Sb., Vyhláška č.499/2006 Sb., Vyhl. č. 62/2013, kterou se mění vyhláška č. 499/2006 Sb., Vyhláška č.268/2009 Sb., Vyhláška č.398/2009 Sb., platné ČSN, Směrnice děkana č. 19/2011 a dodatky.

Zásady pro vypracování

Zadání VŠKP: Projektová dokumentace stavební části k provedení novostavby rodinného domu vedený pod názvem "Detached Family Residence".

Cíl práce: vyřešení dispozice pro daný účel, návrh vhodné konstrukční soustavy, nosného systému a vypracování výkresové dokumentace včetně textové části a příloh podle pokynů vedoucího práce. Textová i výkresová část bude zpracována s využitím výpočetní techniky. Výkresy budou opatřeny jednotným popisovým polem a k obhajobě budou předloženy složené do desek z tvrdého papíru potažených černým plátnem s předepsaným popisem se zlatým písmem. Dílčí složky formátu A4 budou opatřeny popisovým polem s uvedením seznamu příloh na vnitřní straně složky.

Požadované výstupy dle uvedené Směrnice:

Textová část VŠKP bude obsahovat kromě ostatních položek také položku h) Úvod (popis námětu na zadání VŠKP), položku i) Vlastní text práce (projektová dokumentace dle vyhlášky č. 499/2006 Sb.) a položku j) Závěr (zhodnocení obsahu VŠKP, soulad se zadáním, změny oproti původní studii).

Příloha textové části VŠKP v případě, že bakalářskou práci tvoří konstruktivní projekt, bude povinná a bude obsahovat výkresy pro provedení stavby (technická situace, základy, půdorysy řešených podlaží, konstrukce zastřešení, svislé řezy, pohledy, detaily, výkresy sestavy dílců popř. výkresy tvaru stropní konstrukce, specifikace, tabulky skladeb konstrukcí – rozsah určí vedoucí práce), zprávu požární bezpečnosti, stavebně fyzikální posouzení stavebních konstrukcí.

Struktura bakalářské/diplomové práce

VŠKP vypracujte a rozčleňte podle dále uvedené struktury:

1. Textová část VŠKP zpracovaná podle Směrnice rektora "Úprava, odevzdávání, zveřejňování a uchovávání vysokoškolských kvalifikačních prací" a Směrnice děkana "Úprava, odevzdávání, zveřejňování a uchovávání vysokoškolských kvalifikačních prací na FAST VUT" (povinná součást VŠKP).
2. Přílohy textové části VŠKP zpracované podle Směrnice rektora "Úprava, odevzdávání, zveřejňování a uchovávání vysokoškolských kvalifikačních prací" a Směrnice děkana "Úprava, odevzdávání, zveřejňování a uchovávání vysokoškolských kvalifikačních prací na FAST VUT" (nepovinná součást VŠKP v případě, že přílohy nejsou součástí textové části VŠKP, ale textovou část doplňují).

.....

Ing. František Vajkay, Ph.D.
Vedoucí bakalářské práce

Abstrakt

Předmětem bakalářské práce je projekt samostatně stojícího rodinného domu pro čtyřčlennou rodinu v Hrušovanech u Brna. Objekt je dvoupodlažní bez podsklepení a s připojenou garáží. Navrženým materiálem pro nosné i nenosné konstrukce jsou pórobetonové tvárnice. Obytná část budovy je zastřešena sedlovou střechou.

Klíčová slova

Bakalářská práce, rodinný dům, samostatně stojící, pórobeton, sedlová střecha, garáž

Abstract

The subject of bachelor's thesis is project of detached family house for a family of four in Hrušovany u Brna. The building has two floors, without basement and with attached garage. The designed material for loadbearing and non-loadbearing constructions is porous concrete blocks. The residential part of the building is covered by gable roof.

Keywords

Bachelor's thesis, family house, detached, porous concrete, gable roof, garage

Bibliografická citace VŠKP

KOLEGAR, Benjamin. *Detached family residence*. Brno, 2015. 30 s., 92 s. příl.
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stavitelství. Vedoucí práce Ing. František Vajkay Ph.D.

Declaration:

I declare that I worked out bachelor's thesis by myself and that I stated all used information sources.

Prohlášení:

Prohlašuji, že jsem bakalářskou práci zpracoval samostatně a že jsem uvedl všechny použité informační zdroje.

V Brně dne

.....
podpis autora

Thanks:

I thank Mr. Ing. František Vajkay, Ph.D. for the willing and helpful guidance in developing this thesis.

Poděkování:

Tímto děkuji panu Ing. Františku Vajkayovi, Ph.D. za ochotné a vstřícné vedení při vypracovávání této bakalářské práce.

V Brně dne

.....
podpis autora

PROHLÁŠENÍ O SHODĚ LISTINNÉ A ELEKTRONICKÉ FORMY VŠKP

Prohlašuji, že elektronická forma odevzdané typ práce je shodná s odevzdanou listinnou formou.

V Brně dne 27. 5. 2015

titul jméno a příjmení studenta

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Introduction

The objective of this bachelor's thesis is to elaborate project documentation of a detached family house for comfortable living of family of four members according to current standards. The house is designed in a smaller city in South Moravia to provide suitable environment for growing children and also for a comfortable and quiet place to live later in the future. Building has two floors, garage, spacious backyard and no basement. Entire house is built of modern materials, mainly latest porous concrete blocks that provide sufficient thermal insulation so there is no need for additional layer of polystyrene on the peripheral walls.

The thesis includes accompanying and summary technical report, all drawings prescribed by a decree on construction documentation for project execution stage, fire safety and thermotechnical evaluations.

A.1 Identification data

A.1.1 Details about the construction

Name: Family residence

Construction site: Hrušovany u Brna, Pod Střediskem 811, parcel n.1726/193

A.1.2 Details about the builder

Name: Jonatan Kolegar

Adress: Podlesí 22, Brno 624 00

A.1.3 Details about the processor of the project documentation

Name: Benjamin Kolegar

Adress: Kozí 12, Brno 602 00

A.2 List of input documents

- cadastral map of the area
- aerial picture

A.3 Data about the area

a) The size of the area

Area of the land is 598m²

b) Details about the protection of the territory (acc. to law regulations)

There are no law regulations related to this area

c) Details about runoff ratio

All water will be properly drained. Rainwater will be drained into dry well and sewage water into local public canalization.

d) Details about the agreement with land planning documentation

The building is designed on parcel no. 1726/193 that is in a possession of the builder and this parcel is ready and approved by land planning office to be built on.

e) Details about the agreement with zoning decision or public agreement about zoning decision

The building is designed in accordance with zoning decision and also in accordance with public zoning decision. There will be no documentation for special requests.

f) Details about compliance of the general use of the area

The documentation comly requirements given by regulation no. 269/2009 coll. of building law.

g) Details on compliance with the requirements of concerned authorities

Eventual requirements on proprocessing of comments by concerned authorities will be take into consideration and dealt with in requested time given by intended concerned authority.

h) List of exeptions and concessional solutions

There are no proposed exeptions or concessions.

i) List of related and conditional investments

There are no related and/or conditional investments caused by designed building.

j) List of plots and constructions affected by realization of building (acc. to real estate cadastre)

Neighboring parcels: 1726/194
1726/192

A.4 Data about the construction

a) New building or change in finished construction

The design is for new building

b) Purpose of the construction

The building will be used as a family house for 4 person.

c) Permanent or temporary construction

Construction is considered to be permanent

d) Details about protection of building acc. to other legal regulations

The building is not part of any protection zone that would increase protective requirements.

e) Details about compliance with the technical requirements for the construction and general technical requirements securing barrier-free usage of building

Movement of disabled people was not considered during design thus this building is not considered as barrier-free.

f) Details about compliance with the requirements of the concerned authorities and the requirements from other legislation

Eventual requirements on processing of comments by concerned authorities will be taken into consideration and dealt with in requested time given by intended concerned authority.

g) List of exceptions and concessional solutions

There are no proposed exceptions or concessions.

h) Proposed building capacities

Built-up area:	156,3 m ²
Enclosed space:	1070,6 m ³
Usable area:	164,1 m ²
Number of functional units:	1
Number of users:	4

i) Basic balance of the building

Requirements and consumption of fuels and energies will be determined by calculation done by realization office.

Electric power

It will be provided by newly laid connection cable of low voltage.

Potable water

Will be provided from local public water main.

Rain water

All rain water that will fall on building will be drained into dry well and other rain water that will fall on non-paved area will be naturally soaked. All paved area around building are designed to be in the slope.

Sewerage

All wastewater is drained to public sewerage system.

Waste

Waste supposed to be sorted and stored into containers according to type of waste (paper, plastic, glass). All unsorted waste will be disposed of in the garbage contract.

j) Basic assumptions of construction

The start of construction works is scheduled to 5/2016

5/2016 - preparation of construction

6/2016 - earthworks

7/2016 - structural works

9/2016 - finishing works

k) Approximate cost of construction

Rough estimation of price is 3,2 mil. CZK

B. Summary technical report

B.1 Description of the parcel

a) Characteristics of parcel

It is slightly sloped land. Maximal difference in elevations is approximately one meter. Direction of slope is to north-east. The parcel is located on western side of village in area of other parcels ready for newly constructed family houses.

b) Conclusions of executed surveys (geological and hydrogeological)

It was confirmed by geological survey that the soil on given land fulfills values for minimal load-bearing capacity and thus there is no need for special type of foundations. Strip foundations made of plain concrete will suffice.

And from hydrogeological survey we can conclude that the level of underground water will not endanger our construction.

c) Existing protection and safety zones

Construction does not require any protection and is not located in any safety zone.

d) Location relative to flood area, undermined area etc.

Land intended for this project is not located in flood area, the subsoil below this parcel does not indicate any danger of landslides, there are no documented mines below and also seismic activity is not take into account.

e) Influence of construction on surrounding buildings and plots, protection of nearby vicinity and influence of construction on runoff conditions

There are no negative effects caused by construction. All construction site equipment will be stored on given parcel and will not damage surrounding land. Also the runoff conditions will not be negatively influenced.

f) Requirements for sanitation, demolitions, tree felling

Due to the fact that the construction is going to be realized on undeveloped area there is no need for demolition works and there are no trees to be felled. There are only some small shrubberies and grass that will be removed during early earthworks.

g) Requirements for the maximum occupation of the agricultural land or land intended to fulfill the function of forests (temporary/permanent)

The land is not used for agricultural purposes and also is not part of a forest thus there are no requirements for maximum occupation.

h) Technical conditions for connection to existing infrastructure

Parcel is located right next to the local road infrastructure.

i) Accrual links to building, conditional, induced, associated investments

A branch from water main will be done before start of construction works and also electricity meter will be mounted to ensure supply of water and electric energy during construction works. Requirements for other related and conditional works are not established.

B.2 Description of the building

B.2.1 Purpose of building, basic capacities

Building will serve as a family house for family of at most four members. In addition there is a garage for one car attached to the house.

Capacities:	Built-up area:	156,3 m ²
	Enclosed space:	1070,6 m ³
	Usable area:	164,1 m ²
	Parcel area:	598,0 m ²
	Number of functional units:	1

B.2.2 Urban and architectural solution

a) urbanism - territorial regulations, composition of spatial solution

The building is detached family house constructed in non-developed area of the village. There are no territorial regulations issued for this land. In agreement with building authority, spatial planning department and after preliminary consultation about projected plan the building was allowed.

b) architectural solution - shape composition, material and colour solutions

Basic shape is a rectangle with two smaller rectangles attached from both longer sides. The attached room on north side will serve as garage and the one on south side as office. There is a small cutout on south-eastern part from the rectangular shape that creates shadowed part of paved backyard and there is a balcony above in the second floor. The main part of building intended for living is covered by saddle roof and the two attachments are under pent roofs. It is two storey family house without basement.

Foudations will be made of plain concrete, all vertical load-bearing constructions are made of porous concrete blocks and horizontal load-bearing construction are made of reinforced concrete beams, porous blocks and concrete and truss is made of wood.

Designed external plaster is white and roof tiles are colour of burnt or dark orange.

B.2.3 Overall dispositional and operating solution, production technology

Building is a two storey house without basement. There is a main entrance from western side and also entrance to the garage and separate entrance to office part that is located on southern part of building. There is a vestibule right behind main entrance where you can store your coats and there is also connection to the garage so nce you park your car you can go directly to vestibule. From vestibule we can proceed to hall where is a staircase to second floor and small room with toilet. Then there is a large room that serves as kitchen and dining room. From dining room we can get to office, living room and to back porch. On the second floor there are three bedroom and bathroom with separated toilet.

Foudations will be made of plain concrete, all vertical load-bearing constructions are made of porous concrete blocks and horizontal load-bearing construction are made of reinforced concrete beams, porous concrete blocks and concrete and truss is made of wood.

B.2.4 Barrier-free usage of building

This building is not designed as barrier-free thus it is not suitable for disabled people

B.2.5 Safety during usage of building

There are no special requirements on safety during usage for family houses.

B.2.6 Basic characteristics of the building

a) Structural solution

Building is a newly constructed family house. It is designed as two storey house without basement and with saddle roof above the main part. Then there are two rooms attached from both longer sides that are covered with pent roofs.

b) Constructional and material solution

Entire building is based on foundation strips made of plain concrete. Vertical load-bearing and also non-load-bearing structures are made of porous concrete blocks Ytong. Almost all used lintels are Ytong designed. One lintel is made of reinforced concrete because Ytong does not produce suitable element. Ceiling are also designed according to Ytong solution - reinforced concrete beams, porous concrete blocks in between and concrete. Staircase is made of Ytong produced steps supported by walls made of Ytong porous concrete blocks. The column in south-east part is made of reinforced concrete. Roof truss above garage is made of two wallplates and rafters. Other trusses are just rafters mounted on ceiling structures below.

Thermal insulation of foundations is solved with extruded polystyrene and in roof structure mineral wool was used as thermal insulation.

c) Mechanical resistance and stability

All designed load-bearing constructions fulfills stability requirements and mechanical resistance according to statical calculations.

B.2.7 Basic technical characteristics and technological equipment

a) Technical solutions

It is necessary to elaborate special project for all technical equipment. This project will be elaborated by specialist in technical field.

b) List of technological equipment

Kitchen - electrical cooker, range hood, dishwasher

Toilet room - toilet, washbasin

Garage - boiler

Bathroom - Toilet, double washbasin, bathtub

B.2.8 Fire safety solution

See annex *Fire safety report*.

B.2.9 Principles of energy management

a) Criteria for thermotechnical evaluation

Thermotechnical evaluation of proposed building is based on requirements stated by technical standard ČSN 730540.

Evaluated parameters are:

lowest internal surface temperature

heat transfer coefficient U [$\text{W}/\text{m}^2\text{K}$]

b) Usage of alternative sources of energy

There are no alternative sources of energy designed for this building.

B.2.10 Hygienic requirements for buildings, workplaces and communal environment

Ventilation

Fumes generated by cooking process are ventilated by range hood and for general ventilation the only way the building may be ventilated is by natural ventilation through opened windows and doors.

Heating

Heating is provided by system of radiators. Detailed design of heating system will be elaborated by an expert

Lighting

The house will be lit in two ways. Natural daylight through windows and artificial light sources (lamps)

Water supply

Water will be provided by connection to local water main. Pipes of potable water will be laid in floor and wall grooves.

Waste

Waste supposed to be sorted and stored into containers according to type of waste (paper, plastic, glass). All unsorted waste will be disposed of in the garbage contract.

Vibrations

There are no major vibrations caused by using of this building. There might be some small vibrations caused by movement of inhabitants around the house, movement of car in garage or by using of home appliances.

Noise

Noise is restricted by peripheral construction so there not supposed to be noises that would exceed limiting values caused by using of the building.

B.2.11 Protection of building against negative external effects

a) Protection against radon from subsoil

The building is protected against radon rising from the subsoil by insulating layer of modified asphalt. Higher values of radon concentration was not detected in the area so there are no requirements for special anti-radon solutions.

b) Protection against stray voltage

Influence of stray voltage is not expected

c) Protection against seismicity

The building is located in seismically stable area

d) Protection against noise

Protection against noise is ensured by peripheral construction of building.

e) Flood control

Building is not located in area endangered by flood actions.

B.3 Connection to the technical infrastructure

The building is connected to water main and sewerage from the western side of parcel and to power line from the southern part of parcel. Building is not connected to gas supply.

B.4 Traffic solution

a) Description of traffic solution

Traffic solution is designed so the maximal safety is ensured. House is connected to local road.

b) Connection to existing traffic infrastructure

Parcel, on which the building is designed is directly next to the local road. From this road there will be a short access road to enter the garage. There will be lowered curb to ensure a comfortable entry.

c) Parking

There is only one parking space and that is in the garage.

d) Pedestrian and cycling trails

There are no pavements or cycling trails around the parcel.

B.5 Vegetation and landscape solutions

a) Terrain adjustments

The terrain before any adjustments is in a slight slope to north-east. Terrain on the northern half will be leveled and removed soil is going to be stored on southern part of parcel and then used for final landscaping.

b) Vegetation

There is only grass on the land. No trees and bushes has to be removed.

c) Biotechnical measures

No biotechnical measures has been proposed

B.6 Effects of building on environment and its protection

a) Effect on the environment

There might occur slightly higher level of noises during construction works but only during work hours of construction company. Quality of air should remain unaffected.

b) Effect on nature and landscape

No trees will be removed or damaged for realization of this family house. There are no endangered species or plants in the area of construction. Natural functions will not be affected because the area is not significantly important for local nature.

c) Effect of building on system of protected areas Natura 2000

The building is not located in this system of protected areas.

d) Proposal taking into account conditions of the conclusion of the proceeding or the EIA

There is no need to conduct any conclusion from EIA. There are no significant negative influences on the environment.

e) Proposed protection and safety zones, range of restrictions and conditions for protection according to other legal regulations

There are no proposed protection or safety zones.

B.7 Protection of inhabitants

Basic requirements for protection of inhabitants are fulfilled by chosen construction. Common safety devices will be installed and tested during construction.

B.8 Principles of construction organization

a) Needs and consumptions of supplies and their providing

Needs and consumptions of materials will be stated by construction budget elaborated by realization company. Needs of water and energies will be stated on base of project documentation for building work.

b) Drainage of construction site

Water that will not soak to the ground will be drained to newly constructed drainage system. Intake will be protected against clogging by silted soil.

c) Connection of site to existing traffic infrastructure

Construction site will be connected to existing road system via newly constructed gravel road that will be replaced by paved access road after the construction is finished.

d) Influence on surrounding buildings and parcels

Noise, dust and vibrations might occur during construction due to construction process. The aim is to minimize these negative effects on surrounding buildings.

e) Protection of environment and requirements for sanitation, demolitions, tree felling

Due to the fact that the construction is going to be realized on undeveloped area there is no need for demolition works and there are no trees to be felled. There are only some small shrubberies and grass that will be removed during early earthworks.

f) Maximal annexation for construction (temporary, permanent)

Permanent annexation is defined by borders of parcel. If it is going to be necessary temporary annexations might be done after agreement with concerned owners.

g) Waste management during construction

Waste is going to be treated according to law 185/2001. Waste disposal during construction will be ensured by the contractor.

h) Earthworks balance, requirement for supply or deposition

Excavated soil will be used for terrain adjustments, there are no requirements for supply or depositions.

i) Environment protection during construction works

Construction will be conducted according to laws 17/1992 (environment in general), 86/2002 (air protection) and 9/2002 (requirement on noise level of building machines). There are no special requirements for given area.

j) Safety and health principles on construction site

Construction will be surrounded by fence to prevent movement of civilians on the site. Minimal height of fence is 2 m and there will be signs which prohibits entry of unauthorized people and vehicles. Contractor will provide such facilities to provide shelter against adverse weather conditions. There will be person assigned by contractor to ensure safe operation and clean workplace.

k) Adjustments for barrier-free usage

No adjustments are designed.

l) Traffic measures principles

Public traffic will be respected during supply of the construction site. There is not going to be any special traffic restrictions.

m) Special requirements for building construction

There are no special requirements.

n) Construction procedure

The start of construction works is scheduled to 5/2016

5/2016 - preparation of construction

6/2016 - earthworks

7/2016 - structural works

9/2016 - finishing works

D. Documentation of objects and technical and technological equipment

D.1 Documentation of the building

D.1.1 Architectural and building solutions

Purpose of building and capacities

Building will serve as a family house for family of at most four members. In addition there is a garage for one car attached to the house.

Capacities:	Built-up area:	156,3 m ²
	Enclosed space:	1070,6 m ³
	Usable area:	164,1 m ²
	Parcel area:	598,0 m ²
	Number of functional units:	1

Architectural solution, disposition, material and colour solutions

Basic shape is a rectangle with two smaller rectangles attached from both longer sides. The attached room on north side will serve as garage and the one on south side as office. There is a small cutout on south-eastern part from the rectangular shape that creates shadowed part of paved backyard and there is a balcony above in the second floor. The main part of building intended for living is covered by saddle roof and the two attachments are under pent roofs. It is two storey family house without basement.

Foundations will be made of plain concrete, all vertical load-bearing constructions are made of porous concrete blocks

and horizontal load-bearing construction are made of reinforced concrete beams, porous blocks and concrete and truss is made of wood.

Designed external painting is white and roof tiles are colour of burnt or dark orange.

Barrier-free usage of building

This building is not designed as barrier-free thus it is not suitable for disabled people.

Safety during usage of building

There are no special requirements on safety during usage for family houses.

Overall dispositional and operating solution, production technology

Building is a two storey house without basement. There is a main entrance from western side and also entrance to the garage and separate entrance to office part that is located on southern part of building. There is a vestibule right behind main entrance where you can store your coats and there is also connection to the garage so once you park your car you can go directly to vestibule. From vestibule we can proceed to hall where there is a staircase to second floor and small room with toilet. Then there is a large room that serves as kitchen and dining room. From dining room we can get to office, living room and to back porch. On the second floor there are three bedrooms and bathroom with separated toilet.

Foundations will be made of plain concrete, all vertical load-bearing constructions are made of porous concrete blocks and horizontal load-bearing construction are made of reinforced concrete beams, porous concrete blocks and concrete and truss is made of wood.

Building physics

Ventilation

Fumes generated by cooking process are ventilated by range hood and for general ventilation the only way the building may be ventilated is by natural ventilation through opened windows and doors.

Heating

Heating is provided by system of radiators. Hot water is provided by boiler located in garage.

Lighting

The house will be lit in two ways. Natural daylight through windows and artificial light sources (lamps)

Vibrations

There are no major vibrations caused by using of this building.
There might be some small vibrations caused by movement of inhabitants around the house, movement of car in garage or by using of home appliances.

Noise

Noise is restricted by peripheral construction so there not supposed to be noises that would exceed limiting values caused by using of the building.

Principles of energy management

Thermotechnical evaluation of proposed building is based on requirements stated by technical standard ČSN 730540.
There are no alternative sources of energy designed for this building.

Protection of building against negative external effects

see *B.2.11*

Fire protection of building

see *Fire safety report*

Details about required quality of proposed materials and quality of performed work

All used materials must fulfill the parameters stated by project documentation for construction works.

Description of unusual technological procedures

No unusual technological procedures will be used during construction works.

Determination of required controls of covered constructions

There are no required controls of covered construction nor control measurements for this type of building.

D.1.2 Building and construction solutions**Main building production****Earthworks**

Before excavation of foundation strip the top soil will be removed and stored on the edge of parcel to use it for final terrain adjustments. Excavations of foundations strips will be done mechanically with manual final treatment. Excavations will be done mainly for foundations of family house but also for utility networks.

Foundations

Foundations are made as monolithic concrete strips made of concrete C16/20 and there are three lines of concrete lost formwork block

filled also with concrete C16/20. Bottom of foundations will be on original ground in frost resistant depth of 1450 mm. There are going to be passages for sewer system and water main (documentation not included). There is going to be grounding strap of lightning protection system beneath the foundations according to standards.

Vertical constructions

All peripheral vertical constructions are made of porous concrete blocks Ytong Lambda+ P2-350 on thin masonry mortar. Thickness of peripheral walls is 450 mm and thanks to used material there is no need for additional thermal insulation. Internal load-bearing walls between main part and attachments (garage and office) are also made of Ytong Lambda+ of thickness 450 mm to support peripheral walls in second floor.

Internal load-bearing wall to support ceiling structure is made of porous concrete blocks Ytong P4-500 on thin masonry mortar. Final thickness of this wall is 300 mm.

All partitions are made of porous concrete blocks Ytong P2-500 on thin masonry mortar. Thickness of these partitions is 150 mm.

The column that supports the balcony and roof structure in south-eastern corner of family house is made of reinforced concrete.

Horizontal constructions

Concrete base layer

There is a 150 mm thick layer of concrete of quality C16/20 reinforced with steel welded net 100x100 and diameter of rebars 6 mm.

Waterproofing

Waterproofing against moisture from subsoil is made of modified asphalt strips melted with its whole surface on concrete base layer. This insulation is folded and led vertically at

the edges alongside the peripheral wall with minimal overlap over the terrain 300 mm. Diffusion foil in roof structure is placed between rafters and counter-batten.

Lintels

Most of the lintels are type NOP by Ytong. Always designed to fulfill minimal length for particular opening. There are some lintels of type NEP, some U-type of lintels for larger openings and one custom made reinforced concrete lintel used above one larger opening in partition wall.

Ceilings

Ceiling above first floor is Ytong Klasik type which is reinforced concrete joists with axial distance 680 mm. Space between joist is filled with porous concrete blocks of class P4-500 and this structure is then drenched with concrete reinforced with steel mesh.

Ceiling above second floor is Ytong Komfort type. It is similar to previous type but there are Ytong⁺ blocks in between the joists and every fifth block is lowered to create formwork for transverse rib reinforced with bars of diameter 8 mm and anchored to the opposite reinforced concrete ring. Only the ribs are filled with concrete of minimal quality C20/25.

Thermal insulation

Reinforced concrete ring is insulated with porous concrete block P4-500 of thickness 50 mm and 75 mm thick layer of expanded polystyrene.

There is layer of mineral wool used as a thermal and impact sound insulation in floor structures in second floor and extruded polystyrene in floor structure in first floor.

Mineral wool of thickness 180 mm is used as a thermal insulation of roof structure.

Floor structures

Layers of floor structure in first floor are as follows: extruded polystyrene as thermal insulation, separation foil, anhydrite, mirelon and the top layer depends on type of room (tiles or laminate). There is a concrete screed instead of anhydrite in garage and self-leveling layer is used as top layer.

In second floor there is a mineral wool instead of extruded polystyrene to serve also as a impact sound insulation and everywhere but in bathroom is laminate as top layer. There are ceramic tiles in bathroom and WC.

Roof structure

Main part of building is covered with gable roof and the two attachments are covered with shed roofs. Rafters of the gable roof and shed roof above office are mounted on to the inclined roof structure using steel wallplates that are anchored into the reinforced concrete ribs of the ceiling structure. There are counter-battens on the rafters and then roof laths to hold ceramic roof tiles. The other shed roof above garage is a simple structure of two wall plates (one is mounted into peripheral wall), rafters, counter-battens, roof laths and again ceramic roof tiles.

Staircase

The steps are made of reinforced porous concrete. Steps are placed on top of a supporting walls on both sides into the mortar bed. The standard length of bedding is 150 mm. The steps are then lined with desired material (laminate for example) and the bottom surface might be covered by gypsum boards. This construction of staircase create a small storage area for example for cleaning tools.

Openings

All interior door will be constructed as casign type frame. Garage door are of type up-and-over in steel frame. All entrances are made of wood with ditherm glass panes.

All windows are wooden euro-windows with double sealing, periphery fittings and with aluminiu drip cap. There are three types of windows in the building: 1200×600 in garage, 1800×1500 and 1200×1500.

Conclusion

The outcome of this bachelor's thesis is a project of a detached family house for family of four members. The house is designed as two storey building where the second floor has a higher ceiling in comparison with other family houses which was the special requirement of the investor. The first floor is designed as a part of house where the members will reside during the day and second floor serve as a private part mainly for sleeping.

The documentation is elaborated according to the requirements. The documentation includes: study drawings, situations, constructional solutions, details and fire safety solution for the house.

List of used sources

Czech and european standards

- ČSN 73 0540 - Tepelná ochrana budov
- ČSN 01 3420 - Výkresy pozemních staveb - kreslení výkresů
- ČSN 73 4301 - Obytné budovy
- ČSN 730802 - Požární bezpečnost staveb – Nevýrobní objekty
- ČSN 730810 - Požární bezpečnost staveb – Společná ustanovení
- ČSN 730833 - Požární bezpečnost staveb – Budovy pro bydlení a ubytování
- ČSN 730873 - Požární bezpečnost staveb – Zásobování požární vodou

Legislations:

- 499/2006 - about project documentation
- 183/2006 - about spatial planning and building regulations
- 268/2009 - about technical requirement for buildings

Web pages

- www.ytong.cz
- www.isover.cz
- ciko-kominy.cz
- <http://nahlizeniidokn.cuzk.cz/>
- <http://www.tzb-info.cz/>
- www.mapy.cz
- <http://www.komercninemovitosti.com/>
- <http://www.vrata-trido.cz/>
- <http://www.oknamacek.cz/>

List of used abbreviations and symbols

n./no.	number
mm	milimeter
m	meter
m ²	square meter
m ³	cubic meter
acc.	according
coll.	collection
mil.	million
CZK	Czech crowns
ČSN	Česká státní norma (Czech state standard)
U	heat transfer coefficient
EIA	enviromental impact assessment

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Folder D.2 - Building and construction solutions

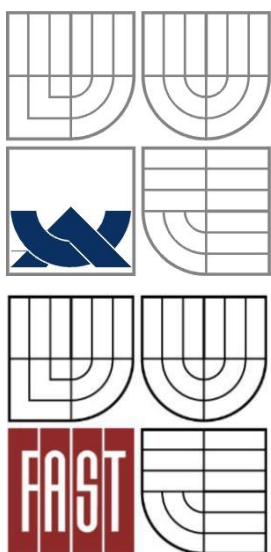
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Folder E - Fire safety

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VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

ATTACHMENTS

SEE INDIVIDUAL FOLDERS OF BACHELOR'S THESIS FOLDER B, FOLDER C,
FOLDER D.1, FOLDER D.2, FOLDER E, FOLDER F

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

AUTOR PRÁCE
AUTHOR

BENJAMIN KOLEGAR

VEDOUCÍ PRÁCE
SUPERVISOR

Ing. FRANTIŠEK VAJKAY, Ph.D.

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